DNA Fingerprinting of Rice Varieties

DNA analysis, now a frequent courtroom evidence tool, is being fine-tuned by an Agricultural Research Service scientist as a faster way to develop and "fingerprint" new rice and wheat varieties to feed a hungry world.

"The world population is increasing at the rate of 96 to 100 million people each year—or nearly the size of another Mexico City every 12 weeks," says J. Perry Gustafson. He is a plant geneticist at Columbia, Missouri.

"We urgently need to improve cereal varieties by getting more genetic diversity into them," he says. "That's why finding and manipulating new specimens of food crops like wheat and rice is so important. Without being able to identify, increase, and use this diversity, the world could eventually run out of food."

Gustafson, working with University of Missouri graduate student Zongmin Zhou, from the People's Republic of China, recognized that humans share a 15-base-pair sequence of DNA with wheat, rice, and mice. Zhou used the knowledge to develop DNA fingerprint probes capable of distinguishing among rice and wheat varieties.

The researchers also used the common sequence to isolate others that produce a DNA fingerprint capable of both identifying and cataloging genetic differences within rice and wheat. They were the first in the world to use a single DNA sequence to distinguish between more than 80 rice varieties from the United States, the Philippines, and the China.

For plant breeders, DNA fingerprinting can be a quick way to select parents with the widest range of genetic variability.

Currently, breeders must use a "cocktail" of up to 40 RFLP (restriction fragment length polymorphism) probes in order to make the same selection for breeding. A single-fingerprint probe such as this one has the potential to cut several years off development of new rice and wheat varieties.—By **Linda Cooke,** ARS.

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Geranium Virus Hard To Identify, Easy To Spread

If those geraniums that looked so beautiful at the nursery last spring just didn't bloom well or ever look healthy in your yard, they may have had a virus or two.

"Viruses do not kill geranium plants, but some can severely reduce vegetative growth by affecting leaves and can reduce flower quality and marketability by deforming blooms and causing color breaks or streaks," says ARS plant pathologist Ramon L. Jordan. A plant virus expert, he leads the Floral and Nursery Plants Research Unit of the U.S. National Arboretum.

Jordan says confusion exists about the exact identity of some of the 15 or so different viruses attacking geraniums—a flower crop worth about $200 million a year to U.S. growers. Geraniums, genus *Pelargonium,* are one of the most rapidly expanding garden crops in the United States.

Now Jordan, working with ARS plant pathologist Gary R. Kinard, has developed new tests that use biotechnology to detect two of the newer viruses: pelargonium line pattern virus and pelargonium ringspot virus. The tests take about 24 hours.

Jordan says the new tests will help ensure that both exported and imported geranium plants—potted or in beds—are free of the two viruses.

Over the last 18 years, Jordan has been pursuing and identifying disease-causing viruses in ornamental plants, vegetables, and trees. What's tricky about the geranium viruses, he says, is the easy way they get around and the 1 to 3 weeks that it takes after infection for their symptoms to appear.

"An infected plant in the greenhouse can be the source of some viruses that can spread via water to the plant sitting next to it," he says. "Other viruses are spread by aphids, while tiny insects called thrips can transmit viruses or carry infested pollen from infected plants to healthy ones.

"Since geraniums are propagated mainly by taking cuttings from established plants, this is likely the most common method of virus spread."

Jordan is working on the other viruses that attack geraniums, as well as those that cause severe problems in such popular flowers as impatiens and gladiolus.—By **Hank Becker,** ARS.

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